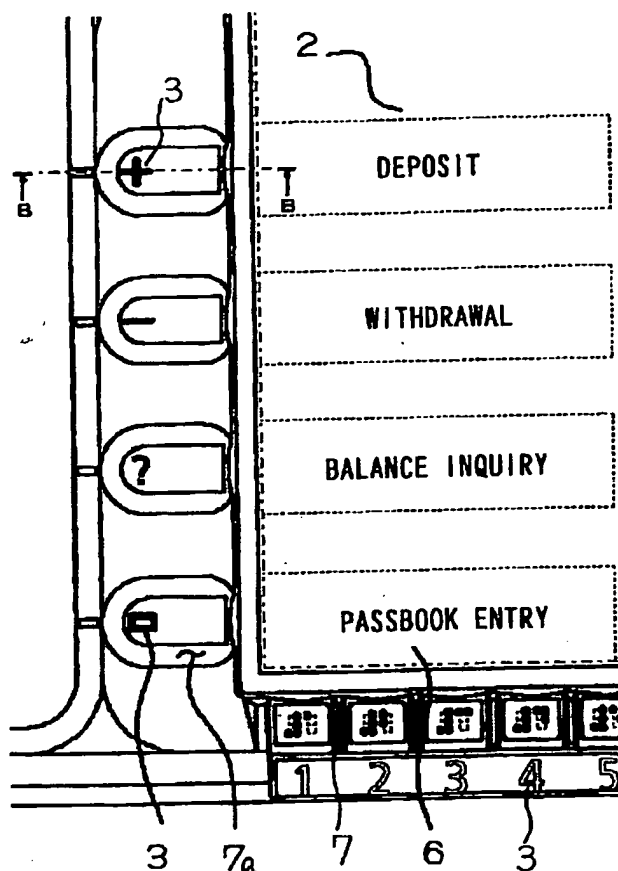


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(51) Int.Cl.⁷ G07F 19/00, H01H 3/00, G05G 1/00
(30) 1999/06/11 (11-165413) JP
(54) **GUICHET BANCAIRE AUTOMATIQUE**
(54) **AN AUTOMATIC TELLER MACHINE**



(57) An ATM having a guide capability in which even a visually handicapped person who can not read braille type can positively operate a customer operating touch panel. An automatic teller machine includes a customer operating touch panel 2 having a plurality of operating keys which are touched for actuation. Guide icons 3 which are embossed to represent the icons of the operating keys are provided in the periphery of the customer operating touch panel at positions corresponding to said plurality of operating keys.



ABSTRACT OF THE DISCLOSURE

An ATM having a guide capability in which even a visually handicapped person who can not read braille type can positively operate a customer operating touch panel. An automatic teller machine includes a customer operating touch panel 2 having a plurality of operating keys which are touched for actuation.

Guide icons 3 which are embossed to represent the icons of the operating keys are provided in the periphery of the customer operating touch panel at positions corresponding to said

plurality of operating keys.

AN AUTOMATIC TELLER MACHINE

FIELD OF THE INVENTION

The present invention relates to an automatic teller
5 machine (hereinafter referred to as "ATM") and in particular to
an ATM having a capability which is suitable for operation by
a visually handicapped person.

BACKGROUND OF THE INVENTION

A prior art ATM will be described with reference to Fig.
10 16. The ATM 1 comprises a customer operating touch panel 2 which
is disposed on a table which is in the form of platen. Item keys
6 such as deposit, withdrawal, balance inquiry, passbook entry,
cancel, yen/confirm, and barrier-free are initially displayed
on the customer operating touch panel 2 as shown in Fig. 17.
15 When any one of these item keys 6 is depressed, processing
corresponding to the depressed item key 6 is enable. For
example, when the item key 6 "withdrawal" is depressed, an array
of numeric ten keys, a thousand digit key 5 and a ten thousand
digit key 5 as shown in Fig. 18 are displayed. The array of
20 numeric ten keys 4 is adapted to enter numerals 1 to 0, and a
thousand digit key 5 and a ten thousands digit key 5 are adapted
to enter the digit of a thousand and ten thousands, respectively.

Some prior art ATMs are provided with a guide capability
using braille type 8 as shown in Fig. 18 for enabling the visually
25 handicapped person to operate it. That is, braille types

representing relevant numerals and characters are embossed along the edge of the customer operating touch panel 2 which is adjacent to the arrayed numeric ten keys 4 and a thousand digit key 5 and a ten thousand digit key 5.

5 SUMMARY OF THE DISCLOSURE

However, there is a problem that the visually handicapped person who is not capable of reading braille type can not operate the ATM through only guiding feature using braille type.

Further, there is much to be desired even for the person capable
10 of reading the braille type for operating the ATM alone without assistance of any other person. Namely, the braille type is limited only to the numeric keys and thus the item function keys cannot be operated without assistance of other person who can read them.

15 It is an object of the present invention to provide an ATM having a guiding capability, which enables a visually handicapped person which can not read braille type to positively operate a customer operating touch panel.

It is another object of the present invention to provide
20 an ATM with a higher ease of operation for the visually handicapped person.

In accordance with a first aspect of the present invention, an automatic teller machine including a customer operating touch panel having a plurality of operating keys which are touched for
25 actuation is wherein guide icons which are embossed to represent

icons of operation keys (or function of each of operation keys) are provided at positions corresponding to said plurality of operation keys.

PREFERRED EMBODIMENTS

5 In a first embodiment, grooves on figured for guiding fingers, which extend from the guide icons to corresponding ones of the operating keys may be provided adjacent to the plurality of guide icons.

10 In a second embodiment, the plurality of operating keys may include item keys for specifying deposit, withdrawal, balance inquiry, passbook entry (or update), cancel, correct, confirm and barrier-free. The item keys are arrayed in a vertical direction on either sides of the customer operating touch panel and guiding projections (or grooves) may be provided adjacent
15 to the guide icons corresponding to the item keys. The item for "confirm" may comprise "\$/confirm" wherein "\$" represents any other currency, e.g., Yen or Euro, £ etc.

20 In a third embodiment, the customer operating touch panel may be provided at part of an area of a table like platen, and the rest area of the table-like platen corresponding to the edge of the platen may be provided with a projecting rib which surrounds the rest area.

25 In a fourth embodiment, the plurality of operating keys may comprise arrayed numeric ten keys which are spaced for entry of numerals 0 to 9, and two keys for thousand digit and ten thousand

digit adjacent to the arrayed numeric ten keys, which are spaced for entry of thousand and ten thousand digits, the numeric ten keys and thousand digit and ten thousand digit keys are arrayed in an array on the lower side of the customer operating touch panel. Grooves having a larger width may be provided at positions adjacent to the guide icons corresponding to the arrayed numeric ten keys and the guide icons corresponding to the thousand and ten thousand digit keys. The larger width is set larger than a spacing between the guide icons neighboring each other.

In a fifth embodiment, the plurality of operating keys may comprise arrayed numeric ten keys which are spaced for entry of numerals 0 to 9, and two keys for thousand digit and ten thousand digit adjacent to the arrayed numeric ten keys, which are spaced for entry of thousand and ten thousand digits. The arrayed numeric ten keys and thousand and ten thousand digit keys may be arrayed in an array on the lower side of the customer operating touch panel. Projecting guides having a width larger than a spacing between the guide icons may be provided adjacent to the guide icons corresponding to the arrayed numeric ten keys and the guide icons corresponding to the thousand and ten thousand digit keys.

In a sixth embodiment, a projection for identifying a boundary (interface) between the guide icons corresponding to the keys for entry of numerals "5" and "6" may be provided

therebetween.

In a seventh embodiment, a braille type portion representing numerals, thousand digit and ten thousand digit may be provided between the arrayed numeric ten keys, the thousand and ten thousand digit key and a plurality of guide icons corresponding thereto.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 A schematic view showing a general appearance of an ATM according to an embodiment of the present invention.

10 Fig. 2 A view showing a first embodiment of the present invention in which a part of arrayed numeric ten keys and thousand digit key and ten thousand digit key on a portion a of the customer operating touch panel shown in Fig. 1 and its periphery are illustrated.

15 Fig. 3 A view showing the first embodiment of the present invention in which item keys on a portion b of the customer operating touch panel shown in Fig. 1 and its periphery are illustrated.

20 Fig. 4 A sectional view taken along the line A-A in Fig. 2.

Fig. 5 A sectional view taken along the line B-B in Fig. 3.

25 Fig. 6 A view showing the second embodiment of the present invention in which the customer operating touch panel shown in Fig. 1 and its periphery are illustrated.

Fig. 7 A sectional view taken along the line C-C in Fig.
6.

Fig. 8 A view showing the third embodiment of the
present invention in which the customer operating touch panel
5 shown in Fig. 1 and its periphery are illustrated.

Fig. 9 A sectional view taken along the line D-D in Fig.
8.

Fig. 10 A sectional view taken along the line E-E in Fig.
8.

10 Fig. 11 A view showing the fourth embodiment of the
present invention in which a part of arrayed numeric ten keys
and thousand digit key and ten thousand digit key on the customer
operating touch panel shown in Fig. 1 and its periphery are
illustrated.

15 Fig. 12 A sectional view taken along the line F-F in Fig.
11

Fig. 13 A view showing the fifth embodiment of the
present invention in which item keys on the customer operating
touch panel shown in Fig. 1 and its periphery are illustrated.

20 Fig. 14 A sectional view taken along the line G-G in Fig.
13.

Fig. 15 A view showing the sixth embodiment of the
present invention in which a part of arrayed numeric ten keys
and thousand digit key and ten thousand digit key on the customer
25 operating touch panel shown in Fig. 1 and its periphery are

illustrated.

Fig. 16 A schematic view showing the appearance of the prior art ATM.

Fig. 17 A view showing the customer operating touch panel shown in Fig. 16 and its periphery.

Fig. 18 A view showing the arrayed numeric ten keys and thousand digit and ten thousand digit keys and its periphery on the customer operating touch panel shown in Fig. 16.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Embodiments of the present invention will now be described with reference to the drawings. Elements shown in Figs. 1 to 15 which are like to those in Figs. 16 to 18 are represented by like numerals.

Referring now to Fig. 1, an ATM of the present invention has a feature in which various guide mechanisms are provided around the customer operating touch panel 2.

In the first embodiment of the present invention, the guide mechanisms are realized by providing around the customer operating touch panel 2 guide icons 3 which are embossed to symbolically represent item keys 6, arrayed numeric ten keys, a thousand digit key 5 and a ten thousand digit key 5.

In Fig. 2, the guide icons 3 for arrayed numeric ten keys 4 and a thousand digit key 5 and a ten thousand digit key 5 are provided corresponding to respective braille types 8 representing keys. In particular, the guide icons 3 for arrayed

numeric ten keys 4 are embossed to represent relevant numerals and the guide icons 3 for a thousand digit key and a ten thousand digit key are embossed to represent the characters of thousand and ten thousands. The characters are typically in Japanese or Chinese characters of "Sen" (1, 000) and "Man" (10, 000) which may be replaced with any suitable other characters or symbols (or signs) expressed in any of other languages, e. g., " 10^3 " or " 10^4 "; "III" or "IV".

Fig. 4 shows the section taken along the line A-A in Fig. 2. The braille types 8 are provided to be directed upward in a slightly inclined manner while the guide icons 3 for the arrayed numeric ten keys 4, a thousand digit key 5 and a ten thousand digit key 5 are provided to be directed downward in a slightly inclined manner. Guide portions 7 are provided by raising the opposite sides of each braille type 8. Guide grooves 7a are provided between the guide portions 7.

In Fig. 3, the guide icons 3 for the item keys 6 are provided just besides (left to) corresponding item keys 6, respectively. For example, marks (signs) such as plus (+), minus (-), question mark (?) and rectangular frame mark are embossed for the item keys such as deposit, withdrawal, balance inquiry and passbook entry (or update), respectively. Although not shown, cancel, correct, yen/confirm and barrier-free may be represented by marks (X), arrow, circle and eye mark, respectively, but are not limited to these marks.

Fig. 5 shows the section taken along the line B-B in Fig. 3. Also in this case, guide portions 7 are provided by raising the periphery of each guide icon 3, so that guide grooves are formed between the guide portions.

5 As shown in Figs. 2 through 5, the guide icons 3 are embossed to symbolically represent arrayed numeric ten keys 4, a thousand digit key 5, a ten thousand digit key 5 and the item keys 6 as icons so that they can be identified with fingers. The guide grooves 7a extend from the guide icons 3 to the arrayed numeric
10 ten keys 4, a thousand digit key 5, a ten thousand digit key 5 and item keys 6 on the customer operating touch panel 2.

Operation of the customer operating touch panel 2 will now be described. When an visually handicapped customer operates the customer operating touch panel 2 on the ATM in Fig. 1, voice
15 guide for instructing the operation procedure is announced from the ATM 1. In Figs. 2 and 3, the customer will touch the guide icons 3 (for selecting items) around the customer operating touch panel 2 with his or her fingers in accordance with the instruction of voice guide to identify the key to be operated
20 from its shape. It is possible for the customer to positively depress the arrayed numeric ten keys, a thousand digit key, a ten thousand digit key and item keys 6 on the customer operating touch panel 2 by moving his or her finger along the guide groove 7. Accordingly, even the visually handicapped person who can
25 not read braille type can conduct the key entry operation.

Since the guide portions for the arrayed numeric ten keys 4, a thousand digit key and a ten thousand digit key 5 are disposed linearly, only leftward and rightward movement of a finger is required to search the icon.

5 Ease of operation is thus improved.

A second embodiment is described with reference to Figs. 3, 6 and 7. In this embodiment, it is possible for the visually handicapped person to identify the position of the item key 6 quickly by providing the guide projections 11 adjacent to the
10 guide icons for the item keys 6 in the periphery of the customer operating touch panel 2.

Four guide projections 11 are provided on each of the right and left sides of the customer operating touch panel 2 so that one of the projections 11 corresponds to each of item keys 6.
15 The guide projections 11 have such a shape that they can be identified with fingers as shown in Figs. 6 and 7. The guide grooves 7a extends from the guide projections 11 to the item key 6 on the customer operating touch panel 2. For clarity, the guide icons 3 which are shown in Fig. 3 are omitted in Figs. 6
20 and 7.

When the visually handicapped customer operates the customer operating touch panel 2 on the ATM 1, voice guide for instructing the operation procedure is announced from the ATM 1. In Fig. 6, the customer touches the guide projections 11 on
25 the right and left sides of the customer operating touch panel

2 according to the instruction of the announced voice guide for
identifying the position and for moving his or her fingers, so
that the customer can depress a desired item key 6. Since the
guide projections 11 have the shape which can be identified with
5 fingers as shown in Figs. 6 and 7, the customer can quickly
identify the order of the arrayed guide projections 11 and their
positions and can depress any of the desired item keys 6.

Now, a third embodiment of the present invention will be
described with reference to Figs. 1, 8, 9 and 10. In this
10 embodiment, a coin ridge (coin-blocking rib-like barrier) 20 is
provided on a table in which the customer operating touch panel
2 is disposed so that it may be used as coin tray and hook for
stick and umbrella. It can be also used as a grip for the
handicapped person for dragging a wheelchair toward the ATM 1
15 when the handicapped person rides on the wheelchair.

In Fig. 8, the customer operating touch panel 2 is disposed
on the right side of the table so that deposit, withdrawal and
the other operations are possible. The coin ridge 20 is
provided along the left edge of the table to define a small table
20 21 within the coin ridge 20. The small table 21 can be used as
elbow rest or a tray on which small articles such as banknotes,
a purse and a bag are placed. Since the coin ridge 20 is formed
to surround the small table 21, it prevents banknotes, purses
and bags from falling down.

25 While the visually handicapped customer performs a deposit

or withdrawal operation, the customer can confirm the amount and kinds of coins which are placed on the small table 21 or can hook his or her stick or umbrella on the coin ridge 20. When the customer uses an wheelchair, he or she can move the wheelchair
5 toward the ATM by grabbing the coin ridge 20.

A fourth embodiment of the present invention will be described with reference to Figs. 11 and 12. In this embodiment, ease of identification when operating the arrayed numeric ten key 4, a thousand digit key and a ten thousand digit key 5 is
10 improved by providing grooves 31 between the guides 7 of the arrayed numeric ten keys 4 and the thousand digit key and the ten thousand digit key 5 for increasing the distance (interval) therebetween, so that it is possible for the visually handicapped person to quickly conduct the key entry.

15 This contemplates to overcome the problem of the prior art ATM in that it is difficult for the visually handicapped person who can not read braille type to make difference between the arrayed numeric ten keys 4, and the thousand digit and ten thousand digit keys 5 since the spacing between the braille types
20 8 for the arrayed numeric ten keys 4 is equal to that of the thousand digit and ten thousand digit keys 5.

Entry of numerals and digit is possible by depressing the arrayed numeric ten keys 4 and the thousand digit and ten thousand digit keys 5 on the customer operating touch panel 2
25 as mentioned above. The guides 7 for guiding the arrayed

numeric ten keys 4 comprises ten grooves 7a for riding the finger to respective keys on entry of the numerals 0 through 9. The guides 7 for the thousand digit key and the ten thousand digit key 5 comprise two grooves 7a for guiding the finger(s) to
5 respective keys on entry of the digits of thousand and ten thousands. The guides 7 for the arrayed numeric ten keys 4 are separated from the guides 7 for the thousand digit key and the ten thousand digit key 5 by means of a groove 31 having a large width.

10 As mentioned above, voice guide for instructing the operation procedure is announced from the ATM 1 when the visually handicapped customer operates the touch panel 2 on the ATM 1. The customer finds the groove 31 having a large width between the guide 7 for the arrayed numeric ten keys 4 and the guide 7
15 for the thousand digit key and ten thousand digit key 5 in the periphery of the customer operating touch panel 2 in accordance with the instruction of the voice guide and moves the finger along the guide groove 7a for the arrayed numeric ten keys 4 on the left side of the panel for entry of the numerals 0 to 9 and
20 can positively depress the desired key of the arrayed numeric ten keys 4 on the touch panel 2. Similarly, the customer can positively depress the thousand digit and ten thousand digit keys 5 by moving the finger along the guide groove 7a for the thousand digit and ten thousand digit keys 5 on the right side
25 of the groove 31.

Ease of identification between the arrayed numeric ten keys 4 and the thousand digit key and ten thousand digit key 5 when touching with a finger is improved due to the fact that the groove 31 is provided between the guide 7 for the arrayed numeric ten keys 4 and the guide 7 for the thousand digit key and ten thousand digit key 5 to increase the distance therebetween so that the key entry by the visually handicapped person can be quickly conducted.

A fifth embodiment of the present invention will be described with reference to Figs. 13 and 14. In the embodiment, the key entry operation by the visually handicapped person can be quickly and positively conducted by making the shape of the guide between the fifth and sixth keys 4 in the periphery of the customer operating touch panel 2 different from that of the other guide.

As mentioned above, entry of numeral is possible by depressing each key of the arrayed numeric ten keys 4 on the touch panel 2. The guide 7 for the arrayed numeric ten keys 4 comprises ten grooves 7a for guiding the finger to respective keys on entry of the numerals 0 to 9. In the present embodiment, a projection 41 is provided between the guide 7 for forming the fifth groove and the guide 7 for forming the sixth groove.

When the visually handicapped customer operates the touch panel 2 on the ATM 1, voice guide for instructing the operation procedure is announced from the ATM 1. On operation of the

arrayed numeric ten keys 4 on the touch panel 2, the customer touches the projection 41 adjacent to the arrayed numeric ten keys 4 to notice that the group of numerals 1 to 5 is separated from the group of numerals 6 to 0 by the projection 41.

5 Accordingly, if the customer moves his or her finger along the guide groove 7a for the arrayed numeric ten keys 4, the customer can quickly and positively conduct an operation of entry of numerals on the customer operating touch panel 2.

10 In such a manner, the visually handicapped person touches the projection 41 adjacent to the guide 7 for the arrayed numeric ten keys 4 in accordance with voice guide to notice that the group of the numerals 1 to 5 is separated from that of 6 to 0 by the projection 41. There is an advantage that the necessary numeral can be found faster than the case in which no projection 41 is
15 provided.

A sixth embodiment of the present invention will be described with reference to Fig. 15. In the present embodiment, ease of identification is improved by providing a wide guide 51 between the guide 7 for the arrayed numeric ten keys 4 and the
20 guide 7 for the thousand digit key and the ten thousand digit key 5 so that the visually handicapped person can quickly conduct key entry. The difference between the sixth and fourth embodiments resides in that the ease of identification is improved by providing a wider groove (concave) 31 in the fourth
25 embodiment whereas the ease of identification is improved by

providing a wider guide (convex, protrusion) 51 in the sixth embodiment.

As mentioned above, entry of numeral is possible by depressing each of the arrayed numeric ten keys 4 on the touch panel 2. The guide 7 for the arrayed numeric ten keys 4 comprises ten grooves 7a for guiding the finger to respective keys on entry of the numerals 0 to 9. The guides 7 for the thousand digit key and ten thousand digit key 5 comprise two grooves 7a for guiding the finger to respective keys on entry of the thousand digit or ten thousand digit. The guide 7 for the arrayed numeric ten keys 4 is separated from the guide 7 for the thousand digit key and the ten thousand digit key 5 by the guide 51 having a larger width.

As mentioned above, voice guide for instructing the operation procedure is announced from the ATM 1 when the visually handicapped customer operates the touch panel 2 on the ATM 1.

The customer finds the guide 51 having a large width between the guide 7 for the arrayed numeric ten keys 4 and the guide 7 for the thousand digit key and ten thousand digit key 5 in the periphery of the customer operating touch panel 2 in accordance with the instruction of the voice guide and moves the finger along the guide groove 7a for the arrayed numeric ten keys 4 on the left side of the panel for entry of the numerals 0 to 9 and can positively depress the desired key of the arrayed numeric ten keys 4 on the touch panel 2. Similarly, the customer can

positively depress the thousand digit and ten thousand digit keys 5 by moving the finger along the guide groove 7a for the thousand digit and ten thousand digit keys 5 on the right side of the guide 51.

5 The meritorious effects of the present invention are summarized as follows.

As mentioned above, in accordance with the present invention, there is provided an ATM having a guide capability, in which even a visually handicapped person can positively
10 operate a customer operating touch panel to enhance the serviceability.

It should be noted that other objects, features and aspects of the present invention will become apparent in the entire disclosure and that modifications may be done without departing
15 the gist and scope of the present invention as disclosed herein and claimed as appended herewith.

Also it should be noted that any combination of the disclosed and/or claimed elements, matters and/or items may fall under the modifications aforementioned.

WHAT IS CLAIMED IS:

1. An automatic teller machine comprising a customer operating touch panel having a plurality of operating keys which are touched for actuation, wherein guide icons which are embossed to represent icons of operation keys are provided at
5 positions corresponding to said plurality of operation keys.
2. The automatic teller machine as defined in Claim 1, wherein a groove or grooves configured for guiding fingers, which extend from said guide icons to corresponding ones of said operating keys are provided adjacent to said plurality of guide icons.
3. The automatic teller machine as defined in Claim 2, wherein said plurality of operation keys comprise item keys for specifying deposit, withdrawal, balance inquiry, passbook entry, cancel, correct, confirm and barrier-free,
5 said item keys are arrayed in a vertical direction on either sides of said customer operating touch panel, and
guiding projections are provided adjacent to said guide icons corresponding to the item keys.
4. The automatic teller machine as defined in Claim 1, wherein said customer operating touch panel is provided at part of an area of a table-like platen, and
the rest area of said table-like platen corresponding to
5 the edge of said platen is provided with a projecting rib which surrounds said rest area.
5. The automatic teller machine as defined in Claim 2, wherein

said plurality of operating keys comprise arrayed numeric ten keys which are spaced for entry of numerals 0 to 9, and two keys for thousand digit and ten thousand digit adjacent to the arrayed
5 numeric ten keys, which are spaced for entry of thousand and ten thousand digits.

said numeric ten keys and thousand digit and ten thousand digit keys being arrayed in an array on a lower side of said customer operating touch panel, and

10 grooves having a larger width are provided at positions adjacent to the guide icons corresponding to the arrayed numeric ten keys and the guide icons corresponding to the thousand and ten thousand digit keys, said larger width being larger than a spacing between said guide icons.

6. The automatic teller machine as defined in Claim 2, wherein said plurality of operating keys comprise arrayed numeric ten keys which are spaced for entry of numerals 0 to 9, and two keys for thousand digit and ten thousand digit adjacent to the arrayed
5 numeric ten keys, which are spaced for entry of thousand and ten thousand digits,

said arrayed numeric ten keys and thousand and ten thousand digit keys are arrayed in an array on a lower side of said customer operating touch panel, and

10 projecting guides having a width larger than a spacing between the guide icons are provided adjacent to the guide icons corresponding to the arrayed numeric ten keys and the guide icons

corresponding to the thousand and ten thousand digit keys.

7. The automatic teller machine as defined in Claim 5, wherein a projection for identifying a boundary between the guide icons corresponding to the keys for entry of numerals "5" and "6" is provided therebetween.

8. The automatic teller machine as defined in Claim 7, wherein a braille type portion representing numerals, thousand digit and ten thousand digit is provided between said arrayed numeric ten keys, said thousand and ten thousand digit key and a plurality
5 of guide icons corresponding thereto.

9. The automatic teller machine as defined in Claim 1, wherein a guiding projection or projections configured for guiding fingers are provided adjacent to said plurality of guide icons, said guiding projection or projections extending from said guide
5 icons to corresponding ones of said operating keys.

10. The automatic teller machine as defined in Claim 1, wherein said guide icons are provided corresponding to items of said plurality of operation keys, said items comprise functions of the operation keys.

11. The automatic teller machine as defined in Claim 10, wherein said items comprise at least deposit, withdrawal, balance inquiry, passbook entry, cancel, correct and confirm.

12. The automatic teller machine as defined in Claim 10, wherein said items further comprise barrier-free.

13. The automatic teller machine as defined in Claim 10,

wherein said item "confirm" comprises "\$/confirm".

14. The automatic teller machine as defined in Claim 3, wherein said item "confirm" comprises "\$/confirm".

15. The automatic teller machine as defined in Claim 1, wherein there is provided a voice guide unit that instructs how to use guide icons.

16. The automatic teller machine as defined in Claim 15, wherein said voice guide unit comprises a guidance explanation of the guide icons item by item and a guidance to follow guiding projections and/or grooves to reach a desired one of said
5 operation key on said touch panel.

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Patent Agents

FIG. 1

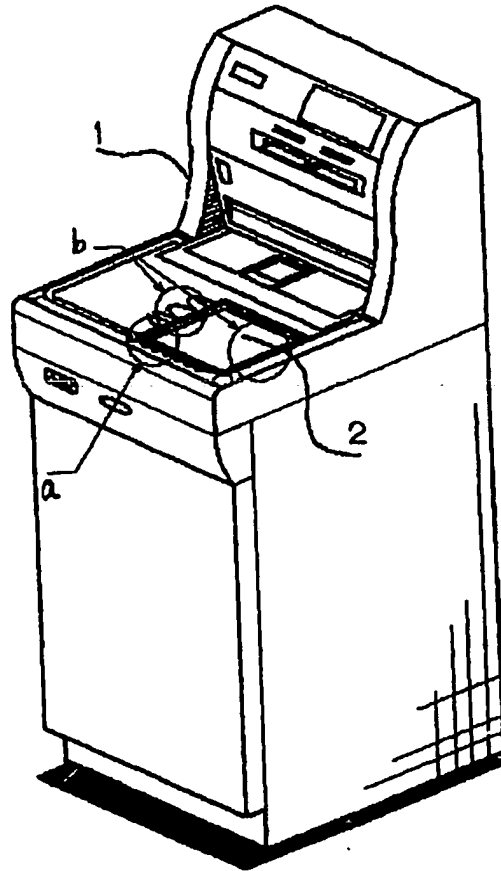


FIG. 2

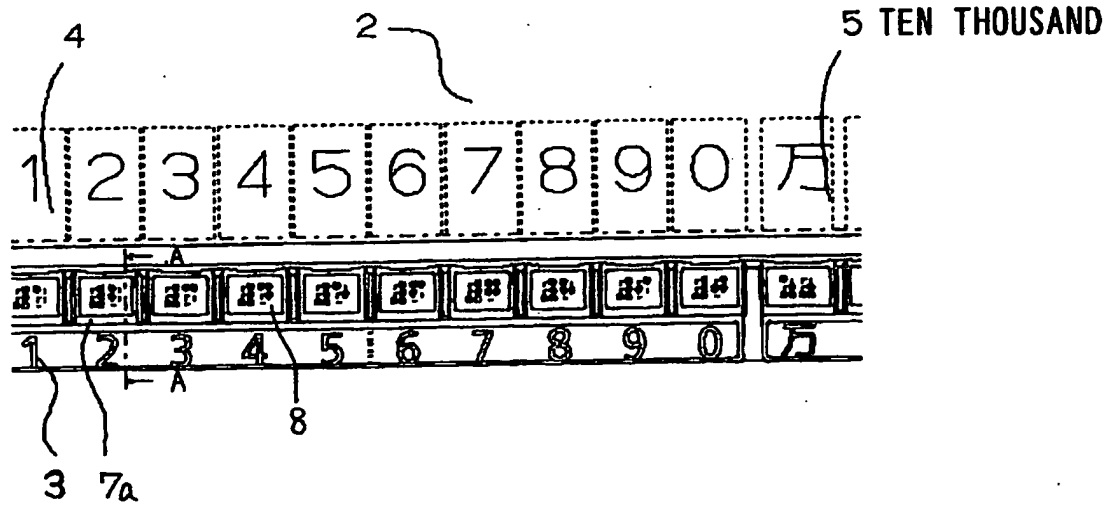


FIG . 3

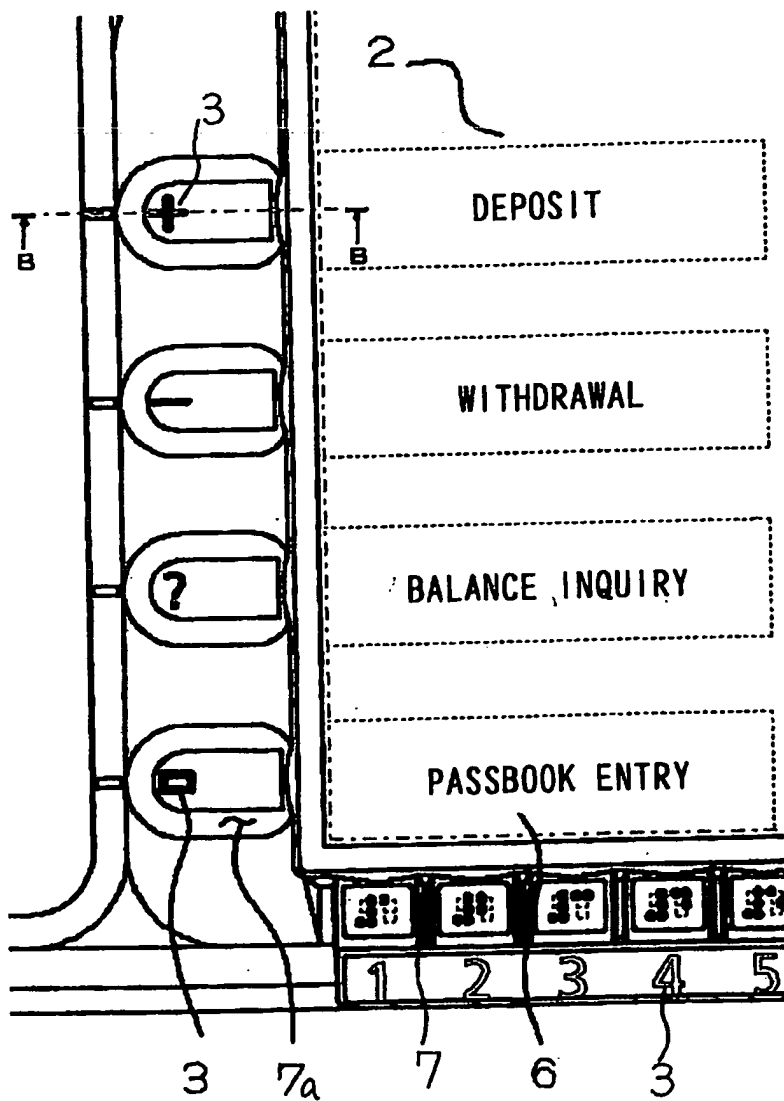


FIG . 4

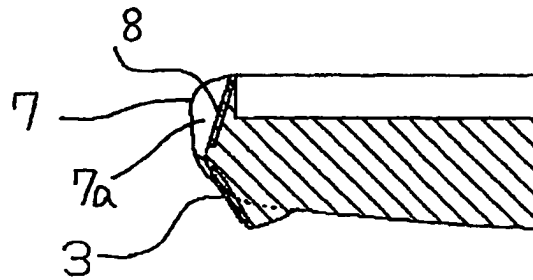


FIG . 5

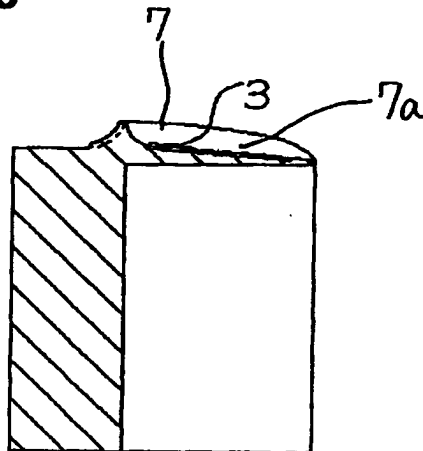


FIG . 6

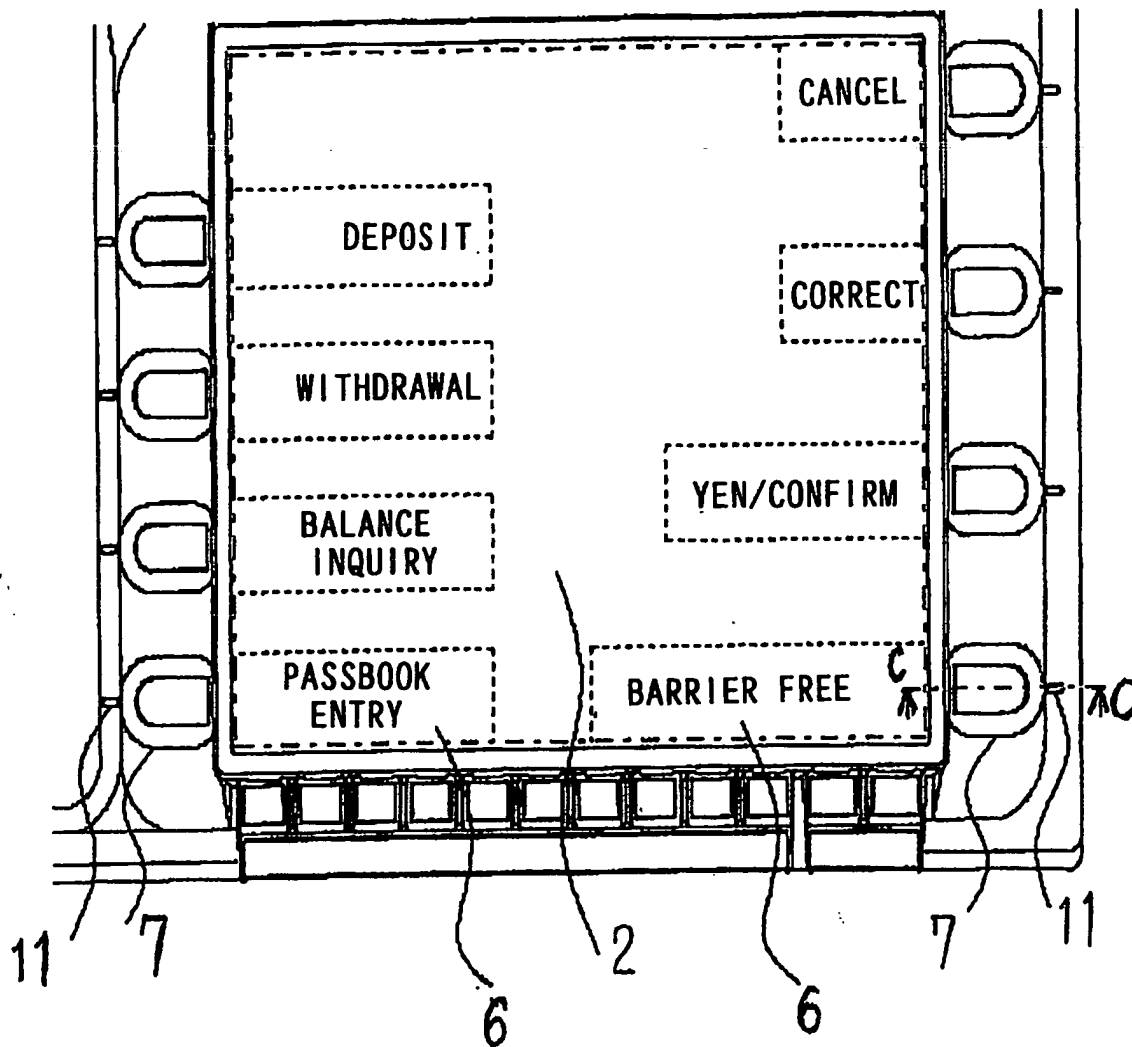


FIG . 7

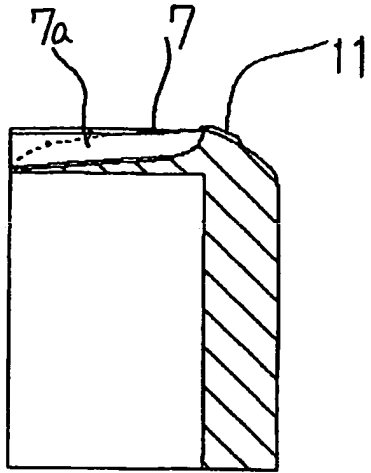


FIG . 8

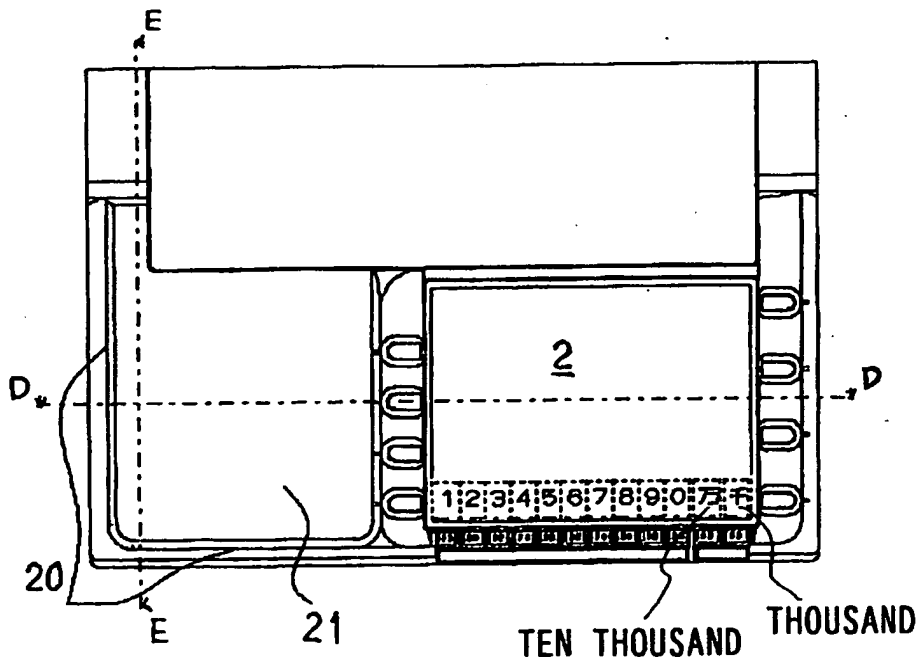


FIG . 9

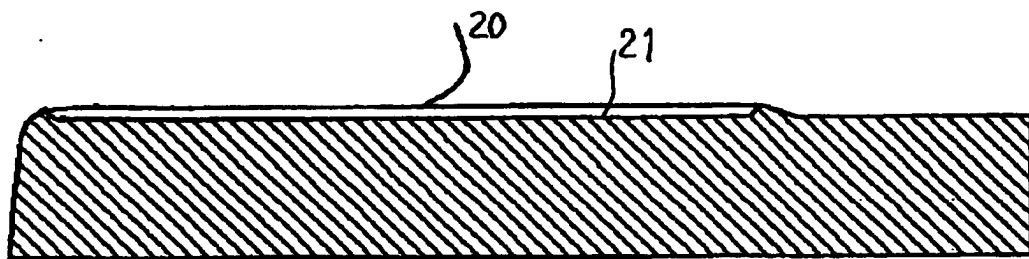


FIG . 10

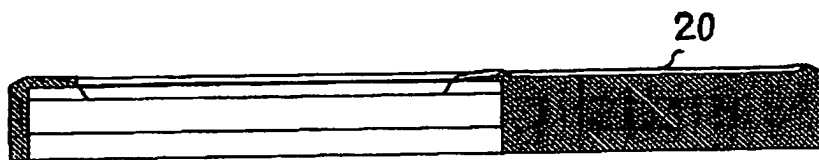


FIG. 11

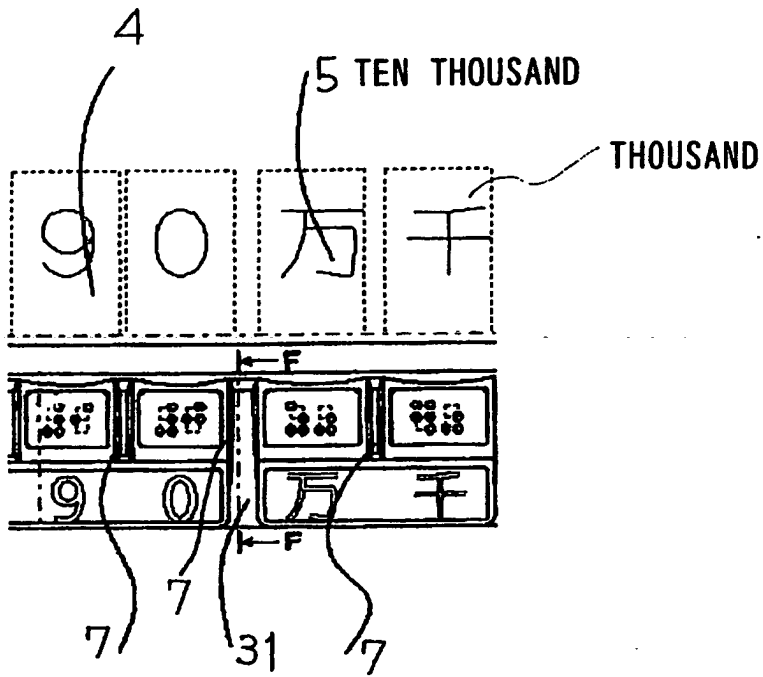


FIG. 12

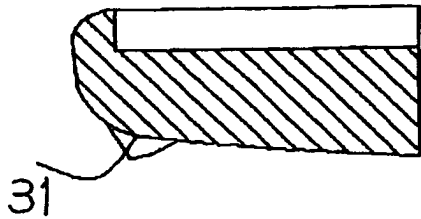


FIG. 13

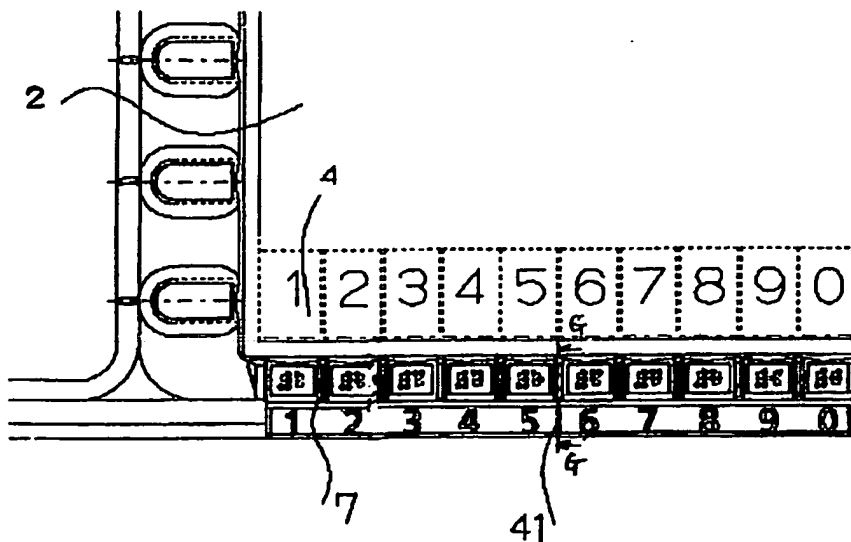


FIG. 14

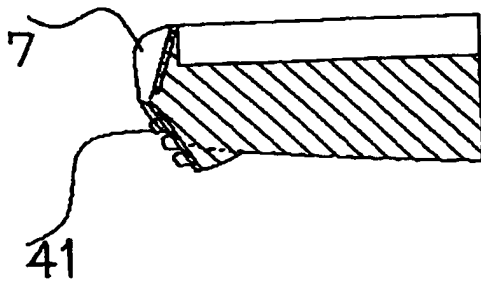


FIG. 15

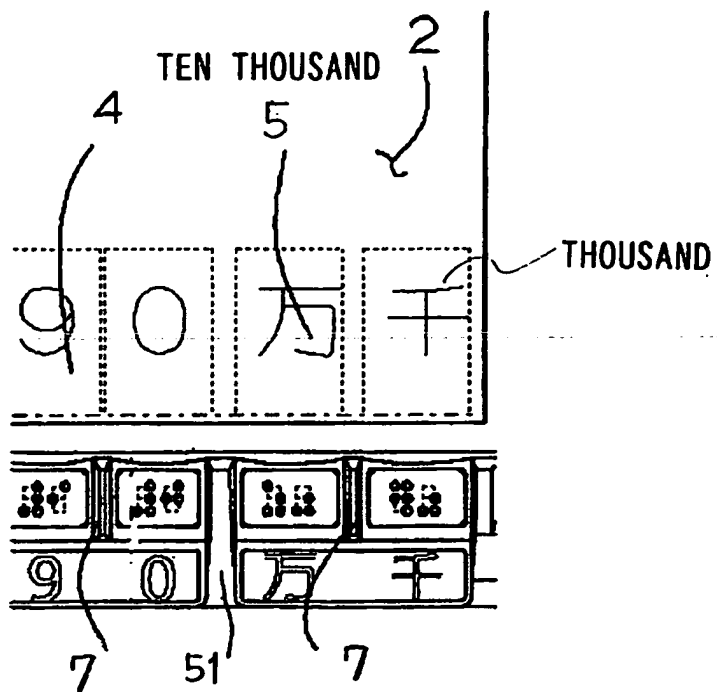


FIG. 16 **PRIOR ART**

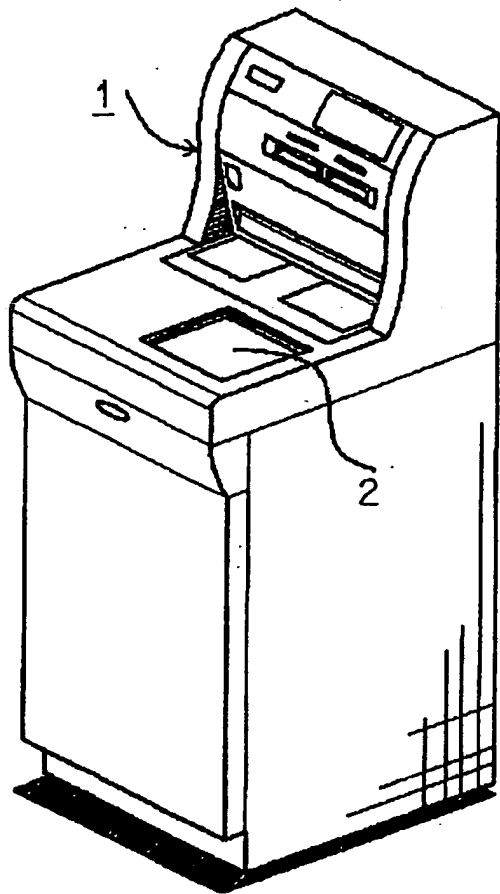


FIG. 17

PRIOR ART

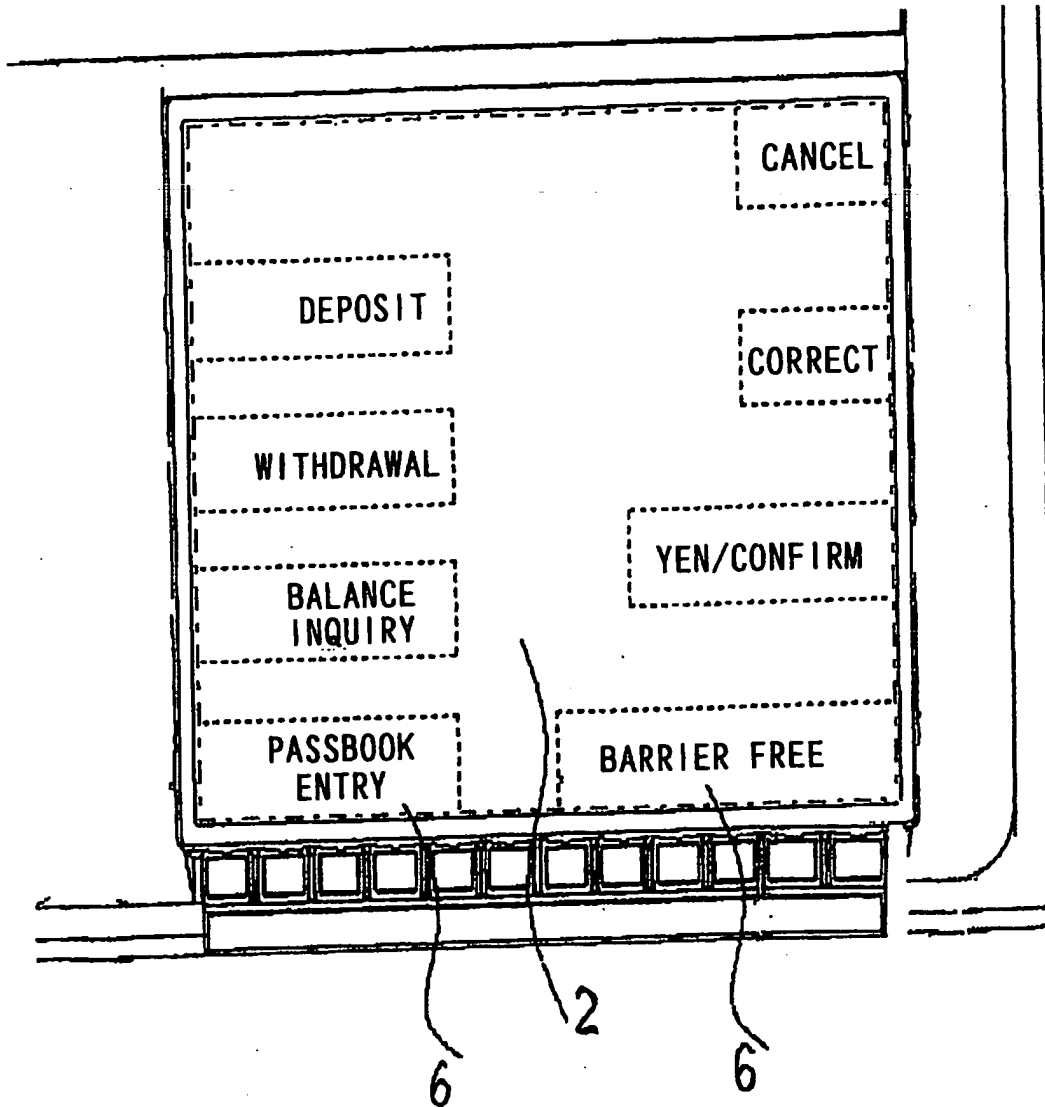
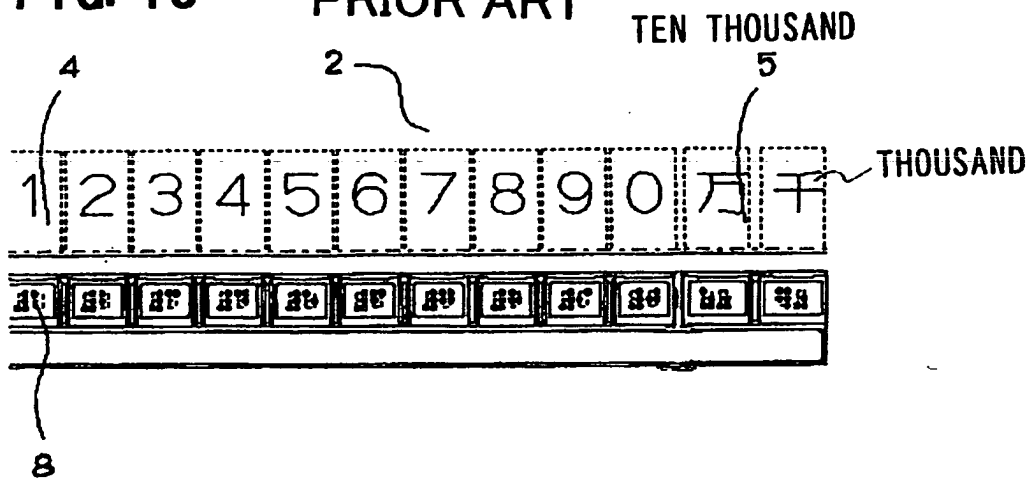
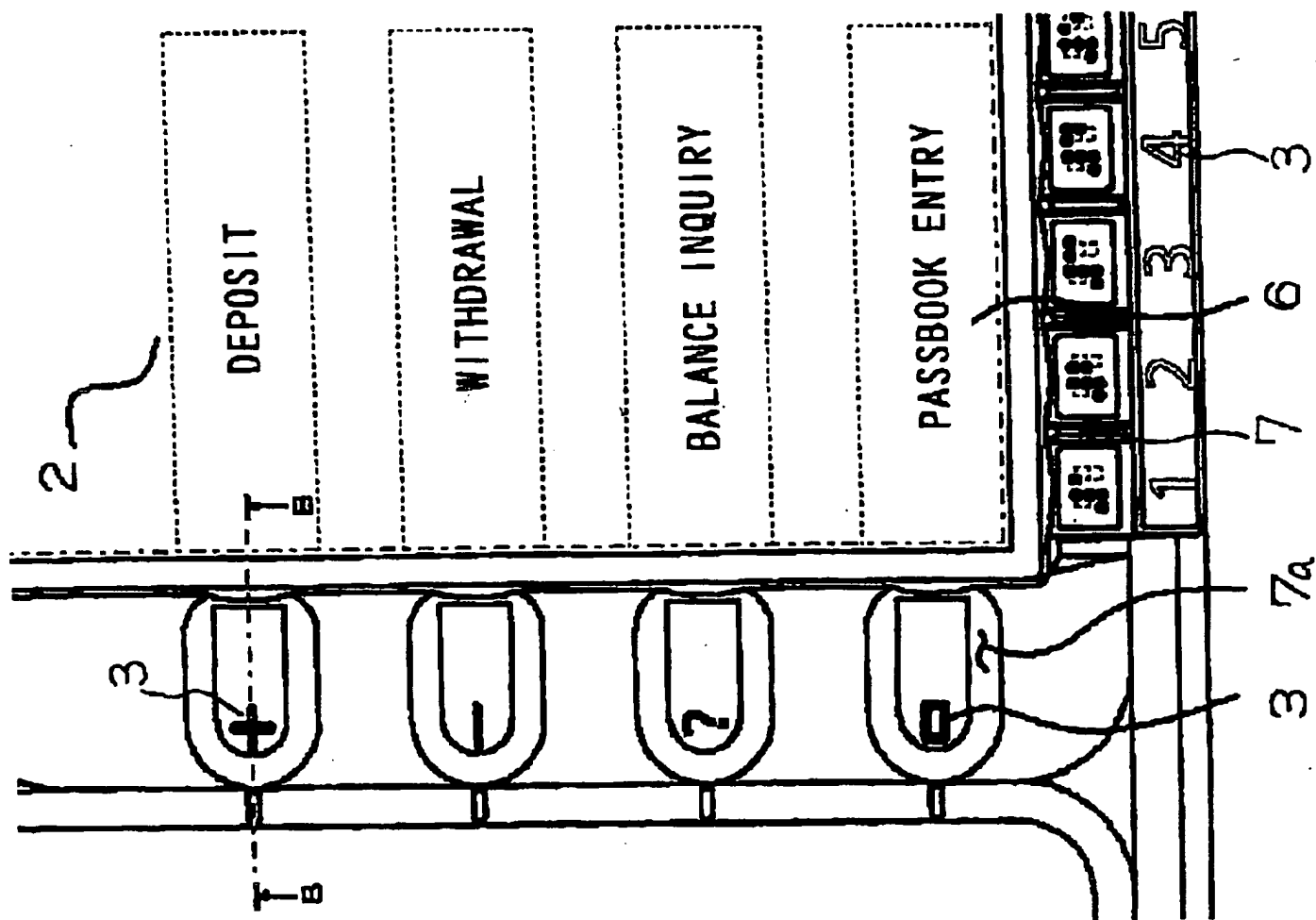


FIG. 18

PRIOR ART





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